

B2 4. (Amended) A piezoelectric multilayer actuator as claimed in claim 1, wherein an external contact point is provided on one side of each of the electrodes.

REMARKS

This Amendment is submitted in response to the Office Action mailed July 6, 2001. The Office Action rejects claim 4 under 35 U.S.C. § 112, second paragraph; claims 1, 3-5 and 16 under 35 U.S.C. § 102(e); and claim 2 under 35 U.S.C. § 103(a).

Claims 1-5 and 16 are pending in this application. Claims 1 and 4 have been amended.

Claim 4 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Particularly, the Examiner states that it is not understood what an "opening on one side" means. Accordingly, Applicant has amended claim 4 to better clarify the claimed invention. Thus, applicant respectfully requests that the patentability of this claim be reconsidered for the following reasons.

As indicated in the specification, "alternating contacting of the electrodes 2 in relation to the external contacting 6 ... is achieved by means of an opening at the electrodes 2" (see Page 6, last paragraph). Thus, this "opening" is merely a point at which the electrode is able to contact the external contacting. Accordingly, Applicant has replaced the word "opening" with the words "external contact point" to better describe the purpose and function of the claimed element. Applicant therefore submits that claim 4 is no longer indefinite.

Claims 1, 3-5 and 16 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,184,609 (*Johansson*). Applicant has amended claim 1 to better clarify the claimed invention. Applicant respectfully submits that *Johansson* does not disclose all of the limitations of the claimed invention. Thus, Applicant respectfully requests that the patentability of independent claim 1 and dependent claims 3-5 and 16 be reconsidered for the following reasons.

As discussed in the specification, a primary object of the present invention “is to provide a multilayer piezoactuator whose cross-sectional geometry is optimized in relation to a cylindrical housing” (see Page 2, first paragraph). In other words, an aim of the present invention is to enhance the filling factor of a single piezoactuator, or, put simply, to reduce the empty space within the housing. Accordingly, claim 1 has been amended to clarify that “each piezoelectric layer [is] formed as a *single* element of hexagonal cross-sectional geometry” (emphasis added). Thus, this single element of hexagonal cross-sectional geometry is optimized to reduce the empty space within the housing.

In contrast, the primary object of *Johansson* is to provide an actuator with “at least a two-axial motion capacity” (see Col. 2, Line 27) thereby allowing the actuator to “achieve a large range of combined motions” (see Col. 3, Lines 65-66). This principle is further reflected in claim 1 of *Johansson* which specifies that it requires “at least two active elements” (see Col. 9, Line 67) which are “positionable independently of each other in at least two independent directions” (see Col. 10, Lines 2-4). Additionally, to achieve a larger range of combined motions, Figs. 1 and 2 of *Johansson* each show embodiments of actuators with six active elements (indicated by the numeral 2 in each figure). Accordingly, *Johansson* discloses actuators that are capable of achieving a large range of combined motion, but do so without optimizing the filling factor and by requiring at least two independent active elements. Thus, *Johansson* does not disclose the use of a single element of a hexagonal cross-sectional geometry optimized in relation to a cylindrical housing. Indeed, *Johansson* arguably teaches away from the present invention since its goal is best achieved through the use of a number of active elements which, in turn, actually decrease the filling factor of a single piezoactuator. Applicant therefore submits that claims 1, 3-5 and 16 are not anticipated by *Johansson*.

Claim 2 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,184,609 (*Johansson*). Claim 2 depends from claim 1. Above, Applicant has argued *Johansson* does not disclose all of the limitations of the claimed invention, including claim 1. Thus, Applicant respectfully submits that based on the arguments presented above, claim 2 is patentable over *Johansson*.

In light of the foregoing, Applicant respectfully requests that claims 1-5 and 16 be deemed allowable at this time.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Versions with Markings to Show Changes Made.**"

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

BELL, BOYD & LLOYD LLC

BY 

William E. Vaughan

Reg. No. 39,056

P.O. Box 1135

Chicago, Illinois 60690-1135

Phone: (312) 807-4292

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claim 1 has been amended as follows:

1. (Amended) A piezoelectric multilayer actuator of hexagonal cross-sectional geometry, comprising:

at least two individual piezoelectric layers, each piezoelectric layer formed as a single element of hexagonal cross-sectional geometry;

at least two electrodes, wherein the electrodes are alternately layered with the piezoelectric layers; and

a housing of circular cross-section.

Claim 4 has been amended as follows:

4. (Amended) A piezoelectric multilayer actuator as claimed in claim 1, wherein an ~~opening~~ external contact point is provided on one side of each of the electrodes.